BATTELLE

US Army Corps of Engineers
New England District

USACE CONTRACT NO. W912WJ-12-D-0004
TASK ORDER NO. 10

2017 UPPER HARBOR HYDRODYNAMIC SURVEY
DRAFT FINAL FIELD SAMPLING PLAN

ENVIRONMENTAL MONITORING, SAMPLING, AND ANALYSIS
NEW BEDFORD HARBOR SUPERFUND SITE

New Bedford, Massachusetts

July 2017

Prepared for

U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

Prepared by

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TABLE OF CONTENTS

1. GENERAL 1

2. INTRODUCTION 1

2.1 Site Location and Description 1
2.2 Project Objectives 2
2.3 Scope of Work 2
2.4 Schedule of Operations 2
2.5 Key Personnel 3

3. METHODS 3

3.1 Current Velocity Measurements 3
3.2 Wave Measurements 4
3.3 Data Reduction and Reporting 4

4. QUALITY ASSURANCE/QUALITY CONTROL 4

4.1 Field-Based Quality Control 4
4.2 Sample Handling and Custody 4
4.3 Instrument Calibration and Pre-Survey Checks 4
4.4 Decontamination 5
4.5 Communication and Documentation of Deviations 5

5. DOCUMENTATION AND REPORTING 5

5.1 Reporting 6

6. SAFETY PROCEDURES 6

7. REFERENCES 6

ATTACHMENTS

Attachment A: Field Log Forms

LIST OF FIGURES

Figure 1. Location of the New Bedford Harbor Superfund Site in Southeastern Massachusetts 11
Figure 2. Velocity Survey Transect Lines, CTD Cast and Wave Gage (WG) Stations. ADCP cross-channel data collection transects are shown in red..... 12

LIST OF TABLES

Table 1. USACE NAE, EPA, Jacobs Engineering and Battelle Team Contact List 15

ABBREVIATIONS AND ACRONYMS

APP	Accident Prevention Plan
ADCP	Acoustic Doppler Current Profiler
CTD	conductivity, temperature, depth
EPA	United States Environmental Protection Agency
FSP	Field Sampling Plan
GPS	global positioning system
dGPS	differential global positioning system
PCB	polychlorinated biphenyl
SSHO	Site Safety and Health Officer
SOP	standard operating procedure
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
USACE NAE	United States Army Corps of Engineers, New England District

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1. GENERAL

Project Title	Environmental Monitoring, Sampling, and Analysis at the New Bedford Harbor Superfund Site, New Bedford, Massachusetts
Survey Title	Task 2.1.C - Upper Harbor Hydrodynamic Survey
Survey Vessel	*Gale Force*
Organization	Battelle
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Chief Scientist	Paul Dragos
Site Safety and Health Officer	Matt Fitzpatrick
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Telephone	781-681-5522 (D. Dahlen)
Cellular Phone (Field)	781-681-5530 (P. Dragos)
Survey Project Number	100043429
Organization	United States Army Corps of Engineers New England District (USACE NAE)
Project Manager	Ellen Iorio
Engineering Technical Lead	Peter Hugh
Address	696 Virginia Road, Concord, MA 01742-2751
Telephone	978-318-8433 (Ellen Iorio) 978-318-8452 (Peter Hugh)

2. INTRODUCTION

2.1 Site Location and Description

The New Bedford Harbor Superfund Site (site), located in Bristol County, Massachusetts, extends from the shallow northern reaches of the Acushnet River estuary south through the commercial harbors of New Bedford and Fairhaven and into 17,000 adjacent acres of Buzzards Bay (Figure 1). Industrial and urban development surrounding the harbor has resulted in sediments becoming contaminated with high concentrations of many pollutants, notably polychlorinated biphenyls (PCBs) and heavy metals. The source of the PCB contamination has been attributed to two electrical capacitor manufacturing facilities that operated between the 1940s and 1970s. Based on human health and ecological concerns, the United States Environmental Protection Agency (EPA) added New Bedford Harbor to the National Priorities List in 1983 as a designated Superfund Site. USACE NAE is responsible for carrying out the design and implementation of remedial measures at the site through an Interagency Agreement with EPA.

2.2 Project Objectives

The object of this task is to collect hydrodynamic data including currents and waves in the Upper Harbor for use in hydrodynamic model calibration.

2.3 Scope of Work

Current velocity measurements will be collected over two tidal cycles, one during spring tide and one during neap tide. By surveying during spring and neap tide conditions the full range of tidal variation will be observed. Wave measurements will be collected over a one-month period overlapping the current measurements. The effort will include:

- Two shipboard Acoustic Doppler Current Profiler (ADCP) surveys performed during spring tide and neap tide.
- Each survey will be 13 hours in duration in order to measure tidal currents over a complete tidal cycle.
- During each survey, nine ADCP vessel transects will be run along cross-channel lines located throughout the upper harbor.
- The transect lines will be reoccupied 12 times at approximately 1-hour intervals.
- Conductivity, temperature, depth (CTD) casts will be taken twice during each ADCP survey to observe the water column structure for calibration of the acoustic instrument.
- A wave gage will be deployed for approximately 1 month in the upper harbor. The gage will be deployed before the first ADCP survey and will remain in place until after the second ADCP survey.
- Available sea surface elevation data will be collected from tide gages in the upper and lower harbor maintained by Jacobs Engineering for the same 1-month period.
- Three-dimensional current data (latitude, longitude, depth and velocity) from ADCP, surface wave time series data and sea surface elevation time series data will be delivered for hydrodynamic model calibration.

2.4 Schedule of Operations

The ADCP survey and wave gage deployment schedule is estimated as follows:

Wave Gage Deployment Mob	On or before 17 July 2017
Deploy wave gage	On or before 17 July 2017 (first opportunity during other monitoring vessel operations, if possible)
Spring Tide Survey Mob/Demob	23 July 2017, weather day 24 July 2017
Spring Tide Survey	23 July 2017, weather day 24 July 2017
Neap Tide Survey Mob/Demob	31 July 2017, weather day 01 August 2017
Neap Tide Survey	31 July 2017, weather day 01 August 2017
Recover wave gage	On or after 7 Aug 2017 (first opportunity during other monitoring vessel operations, if possible)
Demobilization Date	On or after 7 Aug 2017

2.5 Key Personnel

Key personnel and contact information for this survey are summarized in Table 1, by organization and project role. Battelle team personnel will sign in at the start and end of each field day at the Jacobs Engineering trailer. Additionally, field staff working on the water will file a float plan daily at the Jacobs Engineering trailer.

3. METHODS

3.1 Current Velocity Measurements

Current velocity measurements will be collected following Battelle Standard Operating Procedure (SOP) 3-185, Shipboard Collection of Current Velocity and Water Column Backscatter Data using Teledyne RD Instruments Acoustic Doppler Current Profiler. A copy of the SOP is provided in Appendix C to the Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP) (Battelle, 2017).

The velocity surveys will be conducted using a 1200-kHz Workhorse Sentinel ADCP mounted over the side of the *Gale Force*. The ADCP will measure current velocity every 1 to 2 seconds at 0.33-meter intervals or less in the vertical throughout the water column while the vessel is underway. The vessel transects presented in Figure 2 will be occupied once every hour over a complete tidal cycle to determine the three-dimensional current structure throughout the survey area. The ADCP will be programmed to record velocity over either 0.25 meter or 0.33 meter vertical bins depending on the actual instrument range achieved given the ambient noise at maximum vessel operating speed (4 knots or less). Once the appropriate vertical bin size has been determined during initial field instrument checkout, the same bin size will be used throughout both surveys. The start and end of each transect line will be loaded into the vessel's differential global positioning system (dGPS) so the boat operator can navigate along each transect. A Garmin 76CS GPS will be interfaced to the ADCP data collection laptop, so that the data collection software can merge ADCP data with position data. Position and current data will be displayed on the data collection laptop in real time. The tracklines will be run 12 times over a period of approximately 13 hours. Survey data will be recorded on the ADCP Velocity Survey Log Form (Attachment A).

A YSI EX02 CTD sensor package will be lowered over the side of the *Gale Force* to observe and record vertical profiles at two discrete locations (Figure 2). The CTD casts will be performed twice during the tidal cycle survey at or near high and low tide. The hydrographic data will be used to calculate speed of sound profiles for post-survey ADCP calibration and will be provided for hydrodynamic model calibration and/or verification.

The CTD, GPS and dGPS, will be operated according to the standard operating procedures provided in the project QAPP (Battelle, 2017).

3.2 Wave Measurements

Continuous in situ wave data will be collected using a Seabird SBE-26 wave gage. The approximate deployment location is shown in Figure 2. The instrument will be deployed by attaching it to a metal frame to support it just above the seafloor. The frame will be attached via a short ground line to an anchor, which in turn will be attached to a small surface marker float. The instrument sensors will record high resolution pressure measurements. For tide, the pressure sensor output is continuously integrated to average out wave action. Waves are characterized by burst sampling. The instrument will be configured to burst sample at 0.25-second intervals, for 8 minutes, every 3 hours. All data will be recorded internally. At least once during the month-long deployment approximately 2 weeks in, the instrument will be recovered and the data downloaded. This will be done using a vessel of opportunity employed on other monitoring operations.

The planned location for the wave gage deployment is shown in Figure 2. The exact location will be determined in consultation with USACE NAE and Jacobs Engineering in an attempt to balance instrument protection from any scheduled remediation activities or vessel traffic against water depth and fetch exposure. The shallowest possible water is desirable to minimize pressure attenuation.

3.3 Data Reduction and Reporting

ADCP, wave gage and CTD data generated during the survey will consist of rapidly sampled, high-resolution measurements of acoustic backscatter, pressure, temperature, salinity and depth. All data will be electronically logged with the time and position data from GPS. Following the survey, processing of the electronic shipboard data will be conducted using Battelle's Matlab-based physical oceanographic analysis software. ADCP transect, wave and tide time series and CTD vertical profile data will be processed into calibrated units, edited for outliers, reduced as appropriate with temporal or spatial averaging, geo-referenced, and checked for quality. All processing steps will be detailed in the Data Summary Report.

4. QUALITY ASSURANCE/QUALITY CONTROL

4.1 Field-Based Quality Control

The Garmin 76CS GPS will be checked at the beginning and end of each sampling day against an established benchmark at the Sawyer Street facility. A record of the calibration check will be maintained with the field logbook (Attachment A).

4.2 Sample Handling and Custody

No samples will be collected.

4.3 Instrument Calibration and Pre-Survey Checks

The ADCP and CTD will each receive a complete bench check prior to deployment including all manufacturer recommended test and calibration checks as detailed in the respective Battelle SOPs. Prior to conducting the survey, the ADCPs will be mounted on the vessels and tested to

confirm proper operation. Wave gage manufacturer recommended maintenance, pre-deployment calibration and system checks, and pre-deployment set-up procedures will be followed as detailed in the instrument operation manual (http://www.seabird.com/sites/default/files/documents/26_017.pdf) prior to instrument deployment. Following completion of the surveys, ADCP data will be adjusted for local speed of sound as determined by CTD measurements.

4.4 Decontamination

Decontamination is the process of neutralizing, washing, and rinsing exposed surfaces of equipment to minimize the potential for contaminant migration and/or cross-contamination. This procedure does not apply to personnel decontamination that is described in the project Accident Prevention Plan (APP; Battelle, 2016). At the site, the primary source of PCBs and other contaminants is from sediments.

The wave gage and CTD are the only pieces of sampling equipment that will come into contact with bottom sediments. Decontamination of the wave gage, the wave gage bottom mount, and the CTD is required so that on-site contaminants are not carried away from the site. Cross contamination is not an issue. At the end of each survey day, the equipment will be decontaminated as follows:

1) Rinse with tap water or site water for gross decontamination
2) Clean with non-phosphate detergent (e.g., Alconox) and tap water (or site water)
3) Rinse with site water

4.5 Communication and Documentation of Deviations

Any modifications or changes to the planned activities are deviations and must be approved by the USACE NAE Project Manager, or his/her designee. Any deviations from required protocols anticipated prior to field work must be reported to the Battelle Project Manager in advance. The Battelle Project Manager will assess the potential impact and contact the USACE NAE Project Manager (or his/her designee). If circumstances in the field require deviations from the UFP-QAPP Addendum or this field sampling plan (FSP), the Battelle and USACE NAE Project Managers must be contacted as soon as it is safe to do so. All deviations must be documented as such in the Battelle field logbook and brought to the attention of the Battelle and USACE NAE Project Managers at the end of the survey. The field log should indicate the date and time that the Battelle Project Manager was contacted from the field and any resulting verbal approval. The documentation should include a description of the deviation and the reason, an assessment of impact that the deviation has on the study objectives and data quality, and any corrective action implemented. A discussion of deviations will be included in the Data Summary Report.

5. DOCUMENTATION AND REPORTING

All field records will be maintained either in field log forms or in real-time electronic files. The Chief Scientist is responsible for ensuring that all events occurring during the survey are adequately documented on the appropriate log forms (Attachment A). The Chief Scientist or his designee will review the field logbook at the end of each day. It is anticipated that all data for

this survey will be recorded on the ADCP Velocity Survey Log Form (Attachment A). ADCP data will be recorded directly to the personal computer, backed up at the end of each day to an external hard drive, and transferred to a network folder upon return to Battelle. CTD and wave gage data will be offloaded from the instruments to laptop using instrument manufacturer software, backed up to external hard drive, and transferred to a network folder upon return to Battelle.

5.1 Reporting

Reporting requirements for the field activities will include:

- Daily Reporting – An e-mail summary of field activities will be delivered electronically to the USACE NAE (Ellen Iorio, Peter Hugh) within 24 hours of each day in the field.

- Data Summary Report – A data summary report including survey summary, field methods, data reduction and analysis methods along with the data deliverable will be prepared within approximately 6 weeks of completion of the field effort. Data to be delivered for hydrodynamic model use include: three-dimensional current data (latitude, longitude, depth and velocity) from ADCP from the spring tide survey and from the neap tide survey, surface wave time series data and sea surface elevation time series data.

- Monthly Record of Work-Related Injuries/Illness & Exposure – This form will be submitted to the USACE NAE Engineering Technical Lead and Safety and Occupational Health Manager on the 10th of each month. A copy of the form is provided with the APP (Battelle, 2016).

The field logbook will be maintained at Battelle, and will include original field logs.

6. SAFETY PROCEDURES

For further details on safety procedures, please refer to the APP (Battelle, 2016). All Battelle employees participating in the hydrodynamic survey will be hazardous waste operations certified, with current refresher certifications. Daily safety briefings will be conducted by the Chief Scientist with the boat captain and field personnel in attendance. Field crew will don appropriate personal protective equipment at all times while on the site. This includes Tyvek® suits or waterproof foul-weather gear, reflective vests or personal floatation devices, hard hats, safety glasses, gloves and latex boot covers or rubber boots.

7. REFERENCES

Battelle. 2017. Draft Final Uniform Federal Policy Quality Assurance Project Plan Addendum Revision #9 for Dredge Seasons 2016 and 2017, Environmental Monitoring, Sampling and Analysis at the New Bedford Harbor Superfund Site, New Bedford, Massachusetts. Prepared under Contract W912WJ-12-D-0004 Task Order No. 10 for the U.S. Army Corps of Engineers New England District, Concord, MA. February.

Battelle, 2016. Draft Final Accident Prevention Plan, Environmental Monitoring, Sampling and Analysis at the New Bedford Harbor Superfund Site, New Bedford, Massachusetts. Prepared under Contract W912WJ-12-D-0004 Task Order No. 10 for the U.S. Army Corps of Engineers New England District, Concord, MA. October.

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FIGURES

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Note: CDE = Cornell-Dubilier Electronics

Figure 1. Location of the New Bedford Harbor Superfund Site in Southeastern Massachusetts

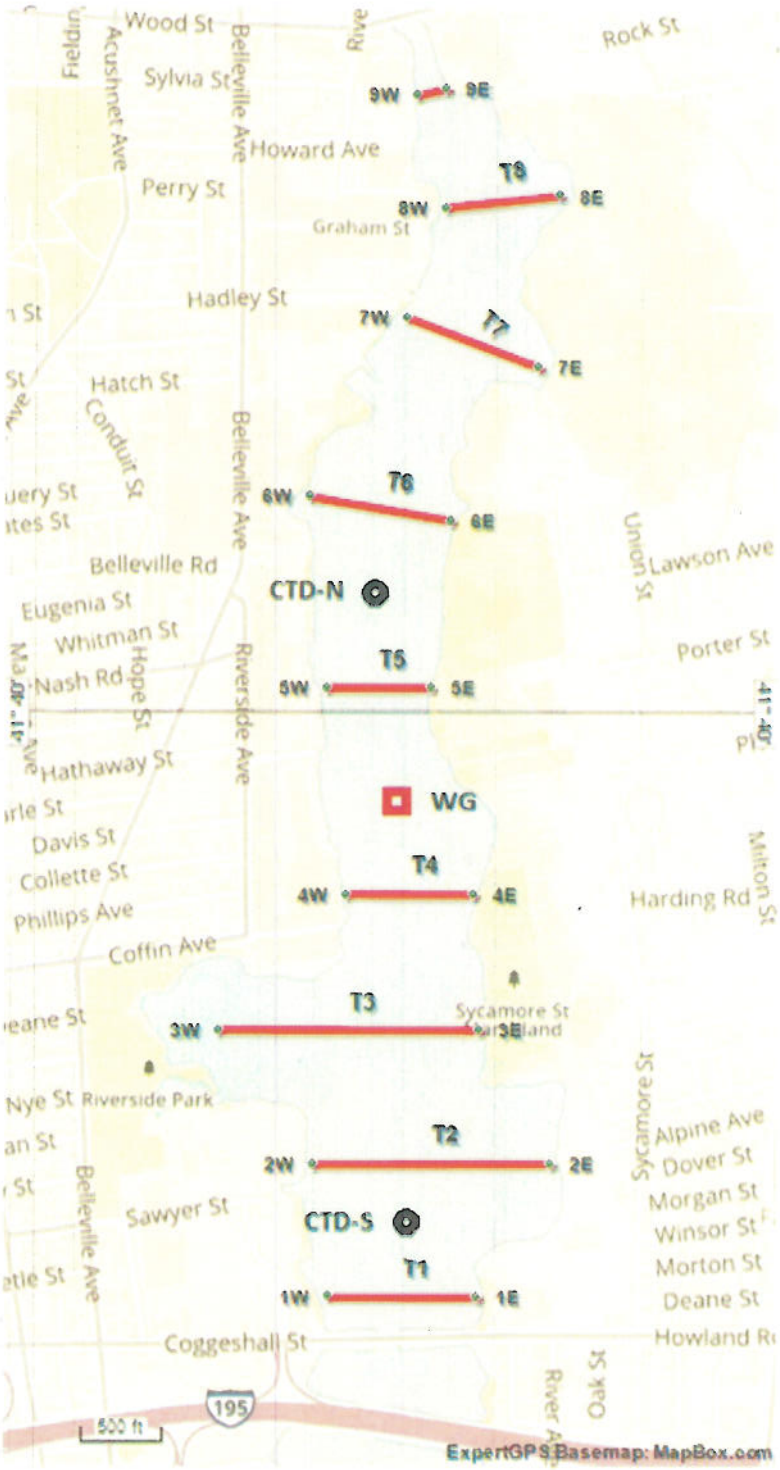

Figure 2. Velocity Survey Transect Lines, CTD Cast and Wave Gage (WG) Stations. ADCP cross-channel data collection transects are shown in red.

TABLES

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Table 1. USACE NAE, EPA, Jacobs Engineering and Battelle Team Contact List

Name	Title	Phone	Email
Ellen Iorio	USACE NAE Project Manager	(O): (978) 318-8433	Maryellen.Iorio@usace.army.mil
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Kevin Coleman	USACE NAE Upper Harbor Technical Lead	(O): (978) 318-8641	Kevin.Coleman@usace.army.mil
Marie Esten	USACE NAE Project Ecologist	(O): (978) 318-8965	Marie.E.Esten@usace.army.mil
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Dave Dickerson	EPA Remedial Project Manager	(O): (617) 918-1329	Dickerson.dave@epa.gov
Mark Gouveia	Jacobs Engineering Point of Contact for Dredging Coordination	(M): (508) 802-2197	Mark.Gouveia@jacobs.com
Lisa Lefkovitz	Battelle Program Manager	(O): (781) 681-5521	lefkovitzl@battelle.org
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Patricia White	Battelle Technical Lead	(O): (781) 681-5507 (M): (617) 721-2527	whitep@battelle.org
Jessica Tenzar	Battelle Field Operations Liaison and Site Safety and Health Officer (SSHO)	(O): (781) 681-5532 (M): (617) 899-5577	tenzarj@battelle.org
Paul Dragos	Chief Scientist	(O): (781) 681-5530 (M): (508) 564-0701	dragosp@battelle.org
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Patrick Curran	Battelle Field Crew/backup SSHO	(O): (781) 681-5543 (M): (631) 525-2106	curranp@battelle.org
Caitlyn Farragher	Battelle Field Crew/backup SSHO	(M): (508) 317-7203	farragher@battelle.org
Sam Moore	Battelle Field Crew/backup SSHO	(M): (330) 304-9007	MooreSB@battelle.org
Rosanna Buhl	Battelle QA Officer	(O): (781) 681-5502	buhl@battelle.org

(O) = Office; (M) = Mobile

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ATTACHMENT A
FIELD LOG FORMS

ADCP Velocity Survey Log Form

SURVEY ID: ____________________ **LOCATION:** ____

DATE (mm/dd/yy): _______________ **INITIALS:** _______________

WEATHER: ____

MONITORING PERIOD (hh:mm) From: __________ **To:** __________

TRANSDUCER DEPTH: ______________________ **TRANSDUCER ORIENTATION:** _______________

INSTRUMENT S/N: ______________________ **BAUD RATE:** ______________________

FIRMWARE: ______________________ **CLOCKS SYNCED:** ☐

SETUP FILE: ____

TRANSECTS:

No.	Start Time	ADCP Filename	Comment
1			

ATTACHMENT A (CONT)

Summary of Daily Field Activities Log

Summary of Daily Field Activities

Project:_____ Date:_____

Stations Visited (include reps and blanks):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

GPS Make model serial number: Trimble TSC3 controller R8s antennae (model 3) (S N 5509R00587)

Morning Check:
Y offset: _____ X offset: _____ Z offset: _____ Initials: _____

Afternoon Check:
Y offset: _____ X offset: _____ Z offset: _____ Initials: _____

Benchmark used for check:
Point 600

Northing (Y)	Easting (X)	NAVD88 (Z)
2701283.44	814293.26	14.29

Weather:
Wind:_____ Waves:_____

Temperature:_____ Sky Cover:_____